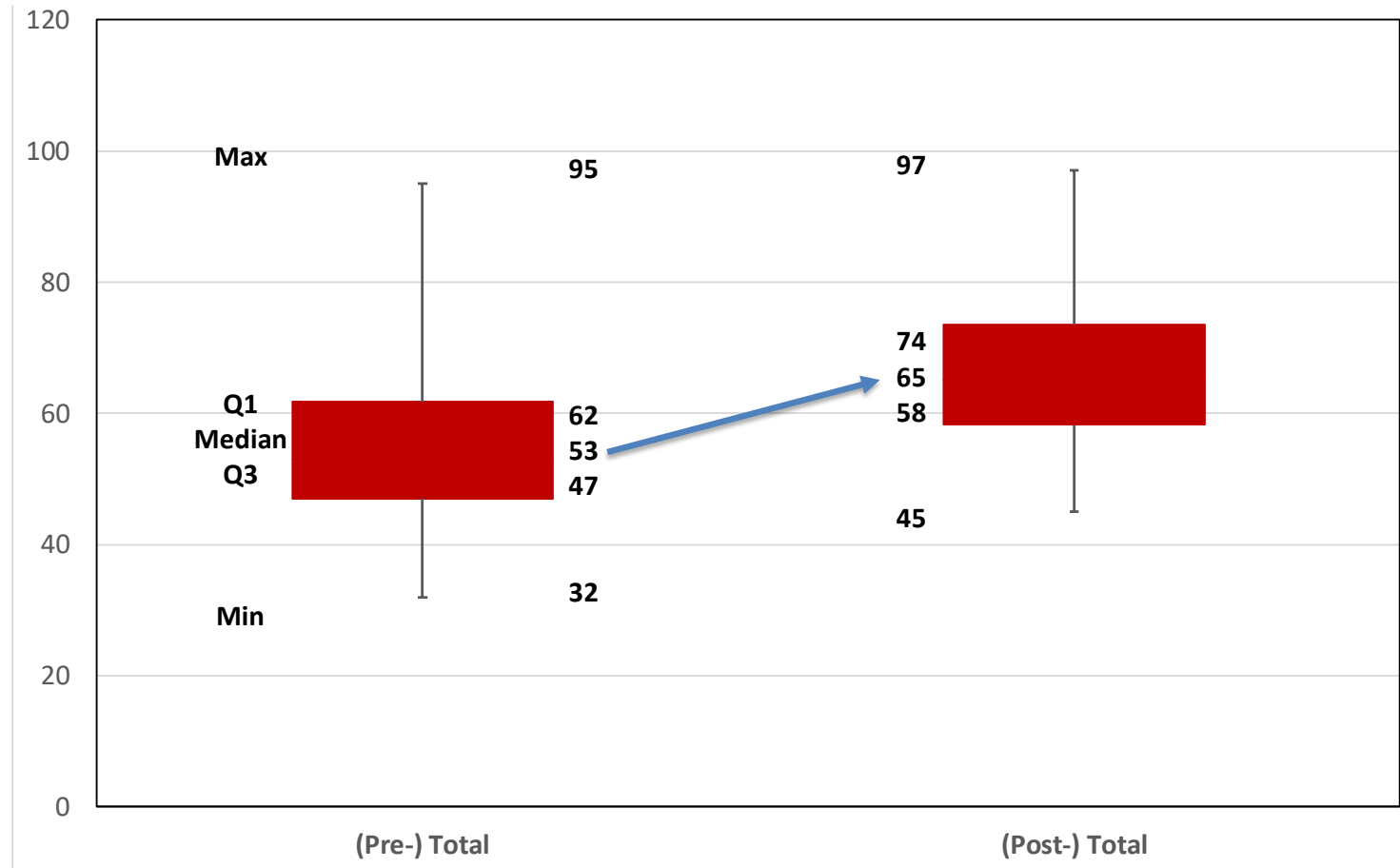


# Statistical Analysis on TOEFL Scores

# Descriptive Statistics

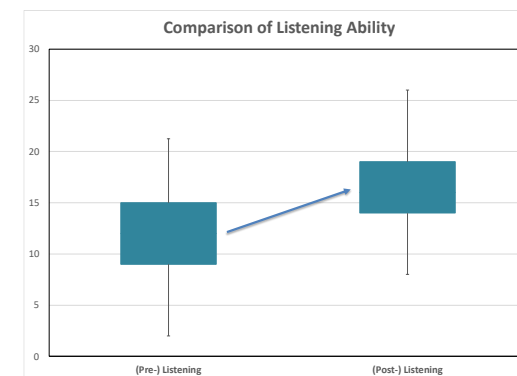
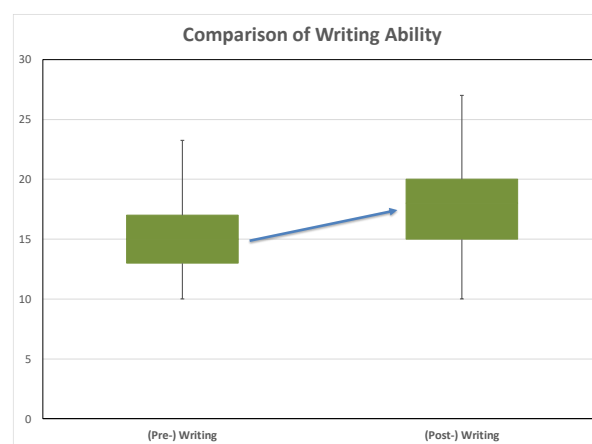
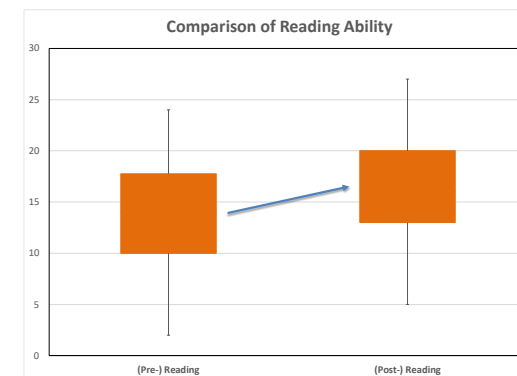
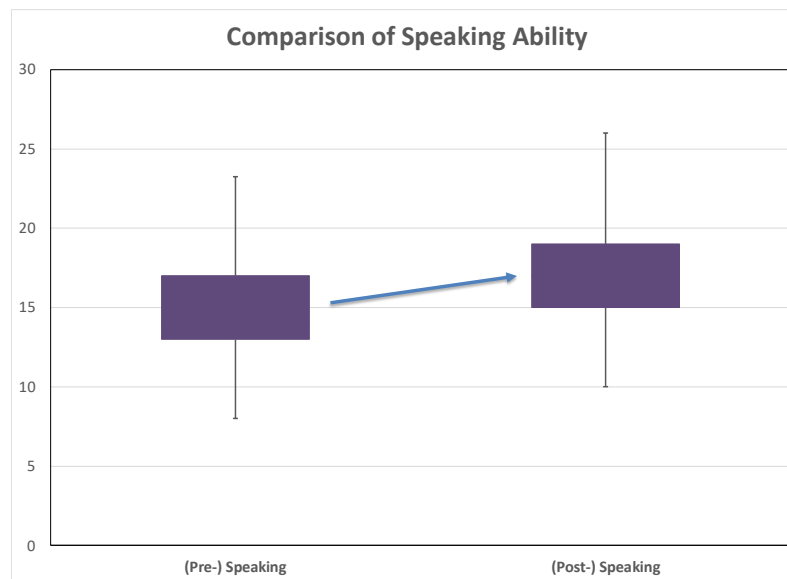
	(Pre-) Result						(Post-) Result				
	<i>Reading</i>	<i>Listening</i>	<i>Speaking</i>	<i>Writing</i>	<i>Total</i>		<i>Reading2</i>	<i>Listening2</i>	<i>Speaking2</i>	<i>Writing2</i>	<i>Total2</i>
Mean	13.99	12.64	14.46	15.41	56.50		16.47	16.41	16.84	17.50	67.23
Median	14	12	14	15	53		16	16	17	18	65
SD	5.22	5.10	3.74	3.22	14.10		5.12	4.33	3.42	3.14	12.65
Max	24.00	25.00	26.00	26.00	95.00		27.00	27.00	28.00	25.00	97.00
Min	2.00	2.00	8.00	10.00	32.00		5.00	8.00	10.00	10.00	45.00

# Comparison of TOEFL Scores (Bix and Whisker Plot)



# Components of TOEFL

- Reading
- Listening
- Speaking
- Writing



# Pairwise $t$ Test of Significance

- Let  $X$  be the score.

- $H_0: X_{pre} \geq X_{post}$

- $H_1: X_{pre} < X_{post}$

- The result of  $t$  test indicates  $H_1$  is accepted, meaning that the post-score is significantly greater than the pre-score.

	<i>Total</i>	<i>Total2</i>	<i>Writing</i>	<i>Writing2</i>	<i>Speaking</i>	<i>Speaking2</i>	<i>Listening</i>	<i>Listening2</i>	<i>Reading</i>	<i>Reading2</i>
Mean	56.5	67.22857	15.41429	17.5	14.45714	16.84286	12.64286	16.41429	13.98571	16.47143
Variance	198.9493	160.0919	10.3911	9.876812	13.9619	11.72857	26.00104	18.76791	27.23168	26.19482
自由度	69		69		69		69		69	
t statistic	-10.6065		-6.99446		-7.25293		-8.72557		-4.60472	
P(T<=t) one-tail	1.95E-16		6.81E-10		2.31E-10		4.72E-13		9.15E-06	